
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part O **Work-Ships**

RULES

2022 AMENDMENT NO.1

Rule No.45 30 June 2022

Resolved by Technical Committee on 26 January 2022

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

“Rules for the survey and construction of steel ships” has been partly amended as follows:

Part O WORK-SHIPS

Chapter 11 WIND TURBINE INSTALLATION SHIPS

11.4 Hull Constructions

Paragraph 11.4.9 has been amended as follows.

11.4.9 ~~Deck Elevating Apparatus and Load Carrying Members~~ Structure of Jacking System Connections to Hulls

~~Load carrying members of self-elevating ships~~ The structure of jacking system connections to hulls are to be in accordance with the ~~requirements in~~ following (1) and (2):

- (1) ~~Scantlings of load carrying members which transmit loads from the legs to the hull such structures~~ are to have sufficient strength for the loads prescribed in 11.4.7 and Chapter 3, Part P and 11.4.7.
- (2) ~~Constructions of load carrying members are to be so arranged that loads transmitted from the legs are to be properly diffused into the hull structures.~~

11.7 Machinery

Paragraph 11.7.2 has been amended as follows.

11.7.2 Tests

1 Before installation on board, equipment and components constituting ~~the~~ machinery installations are to be tested at the manufacturers in accordance with the relevant requirements in **Part D.**

2 Notwithstanding ~~the requirements in -1 above,~~ for machinery installations, (other than boilers, pressure vessels belonging to Group I or II and piping systems which contain inflammable or toxic liquids,) used solely for ~~the operations~~ which is the intended purpose of the ship, ~~the~~ tests may be as deemed appropriate by the Society.

3 ~~The~~ Systems or the equipment essential for the safety of the ship or for the propulsion of the ship (only applicable to the ships which have the main propulsion machinery) are, after installation on board, to be subjected to performance tests after installation on board.

4 Mechanical components used for load carrying components, torque transmitting components, components for fixation systems and hydraulic components of the jacking systems are to be subjected to the hardness tests and non-destructive tests specified in 5.5.1, Part D.

5 Rack and pinion jacking systems are to be tested in accordance with the following. However, in cases where systems are of equivalent design, the Society may allow such tests to be omitted in consideration of established service histories.

- (1) A load equivalent to 150 % of the maximum normal holding capacity rating of the unit is to be applied, and the climbing pinion is to make at least one complete revolution.
- (2) The unit is to be disassembled and it is to be confirmed that all pinions and gears are free from abnormal defects by non-destructive tests deemed appropriate by the Society.

Paragraph 11.7.3 has been amended as follows.

11.7.3 Jacking Systems*

1 The following plans and documents are to be submitted to the Society in addition to those specified in Chapter 15, Part B.

(1) Plans and documents for approval

(a) A description of the jacking system and plans for its arrangement

(b) Rack and pinion jacking systems

i) Detailed plans for rack and pinions (including details of tooth geometry in cases where it is not an involute gear)

ii) Plans for power transmitting components, shafts, bearings, couplings, casings and brakes

iii) Detailed plans for gear elements

iv) Diagrams for electric and hydraulic control systems

v) Detailed plans for hydraulic power packs

iv) Detailed plans for electric motors (including specifications and operating characteristics)

vii) Detailed plans for fixation systems (if provided)

viii) Prototype test procedures (if applicable)

(c) Ram and pin jacking systems

i) Detailed plans for hydraulic cylinders and control valves

ii) Details for pins and activating mechanisms

iii) Detailed plans and arrangements for pin holes

iv) Diagrams for electric and hydraulic control systems

v) Detailed plans for hydraulic power packs

vi) Detailed plans for electric motors (including specifications and operating characteristics)

vii) Detailed plans for casings and supporting structures of the system (including fixed and movable crossheads)

(d) Detailed plans for monitoring and alarm systems

(e) Material specifications for load carrying components (racks and jackcases for rack and pinion units, jacking pins and yokes for hydraulically actuated units, etc.), torque transmitting components (climbing pinions, gears, pinions, planet carriers, pins, shafts, torque supports, couplings, coupling bolts, torque flanges, brakes, etc.), fixation system components and hydraulic components (hydraulic cylinders, actuators, etc.) of (b) and (c) above

(f) Design calculations (including strength, fatigue, buckling, rigidity, critical speed (resonance) analysis) of (b) and (c) above

(2) Plans and documents for reference

(a) Documents for Failure Modes and Effects Analysis (FMEA)

(b) Details and procedures for non-destructive tests for components subject to direct load (including inspection locations, inspection types and acceptance criteria)

(c) Details for operating temperature and heating arrangements for low-temperature service

(d) Limits for alignment and misalignment between rack and pinions

~~12~~ The ~~driving gears, mechanisms, strength and safety devices~~ material of load carrying components and torque transmitting components, fixation system components and hydraulic components of jacking systems are to be those deemed appropriate by the Society suitable for the temperature conditions of the operating areas of intended use and are to comply with Part K.

~~23~~ A jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) ~~is~~ are to be such as to maintain the safety of the ship in the event of the failure of any

part of the system, control device or loss of the source of power for the driving gear. A suitable monitoring device is to be provided at a permanently attended control station to indicate such failure.

4 With respect to -3 above, Failure Modes and Effects Analysis (FMEA) is to be used to confirm that the safety of the ship will not be compromised by the jacking system.

35 Where electrical motors, hydraulic or pneumatic systems are used as a source of power for a jacking system (including fixation systems in cases where separately equipped as holding mechanisms), two or more sets of sources of power are to be provided so as to be capable of operating the jacking system even when one of the sets fails. However, one set may be acceptable for ships designated for use in restricted areas (except for ships which have a large embarking capacity).

46 Elevating Jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to be designed and constructed for the maximum lowering and lifting loads of a ship as specified in the ship's operating manual for at least the following loading conditions. In addition, friction loss from leg guiding and the effect of variation in location of the centre of gravity of the hull are to be included in the maximum lowering and lifting loads.

- (1) Normal lifting, lowering, holding of hull (static loading)
- (2) Pre-load lifting, lowering, holding of hull (static loading in cases where lifting and lowering as well as combined loading in cases where holding)
- (3) Normal lifting, lowering, holding of legs (static loading)
- (4) Severe storm holding under the elevated condition and the afloat condition (combined loading)

7 Allowable stresses of the mechanical components used in jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to comply with the values specified in 7.2.2, Part P under all the loading conditions specified in -6 above. In addition, buckling strength and fatigue strength are to be in accordance with the requirements of 7.1.5 and 7.1.6, Part P respectively. In the case of gears, tooth surface contact and tooth root bending are to be in accordance with requirements specified otherwise by the Society.

58 Elevating Jacking systems (including fixation systems in cases where separately equipped as holding mechanisms) are to be able to withstand the forces imposed upon a ship from the maximum environmental criteria for the ship.

9 All lifting and lowering operations as well as applicable repeated loads are to be considered for fatigue strength. In the case of gears, the following safety factors are to be applied for cumulative fatigue in the fatigue design life.

Tooth surface contact: 1.0

Tooth root bending: 1.5

10 In cases where hydraulic cylinders are used as power sources for ram and pin jacking systems, the requirements of Chapter 10, Part D are to be applied mutatis mutandis. For piping attached to such cylinders, the requirements of Chapter 12 and Chapter 13, Part D are to be applied mutatis mutandis.

611 Elevating Jacking systems are to be operable from central jacking control stations.

712 Jacking control stations are to be provided for the following safety devices:

- (1) Audible and visual alarms for jacking system overload and out-of-level. For rack and pinion jacking systems, visible and audible alarms for rack phase differential are to be provided in cases where required for design reasons.
- (2) Indicators for the following:
 - (a) The inclination of the ship on two horizontal perpendicular axes
 - (b) Power consumption or other indicators for the lifting or lowering of the legs, (as applicable)

(c) Brake release status

813 ~~A~~ ~~Communication systems~~ ~~is~~ ~~are~~ to be provided between the central jacking controls and ~~a~~ locations at each leg.

11.7.4 Bilge Piping

The bilge piping of self-elevating ships is to be in accordance with the requirements in following (1) to (3):

Sub-paragraph (3) has been amended as follows.

- (3) Notwithstanding 13.5.3-1, Part D, Bbranch bilge suction pipes from each compartment are to have an internal diameter obtained from the following formula or be standard pipes which have an internal diameter nearest to the calculated diameter. In cases where the internal diameter of such standard pipes is less than the calculated value by 5 mm or more, standard pipes of one grade higher diameter are to be used.

$$d' = 2.15\sqrt{A} + 25 \text{ (mm) minimum } 50 \text{ (mm)}$$

where

d' : Internal diameter of branch bilge suction pipes (mm)

A: Wetted surface area of the compartment, (excluding stiffening members) when the compartment is half filled with water (m^2)

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2022.
2. Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction is before the effective date.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part O **Work-Ships**

GUIDANCE

2022 AMENDMENT NO.1

Notice No.31 30 June 2022

Resolved by Technical Committee on 26 January 2022

Notice No.31 30 June 2022

AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

Part O WORK-SHIPS

O11 WIND TURBINE INSTALLATION SHIPS

O11.7 Machinery

Paragraph O11.7.3 has been added as follows.

O11.7.3 Jacking Systems

1 In applying **11.7.3-2, Part O of the Rules**, materials are to meet the specified values for impact tests equivalent to or greater than those of steels used for hull construction in cases where materials are used for which there are no specified values for the impact tests in **Part K of the Rules**.

2 The wording “permanently attended control station” specified in **11.7.3-3, Part O of the Rules** means the locations where jacking systems are controlled. In cases where fixation systems are separately provided as holding mechanisms, the locations where such systems are controlled are also included.

3 The wording “requirements specified otherwise by the Society” specified in **11.7.3-7, Part O of the Rules** means the requirements specified in **Annex 5.3.5, Part D of the Rules**.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2022.
2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction is before the effective date.